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(54) **Cash handling system.**

(57) An automatic cash handling machine contained within a physically secure housing having the ability to receive and dispense notes or bills and coins, and the ability to receive and dispense non-currency forms of exchange under the control of a computing system which computing controls the creation of at least one secure record of each transaction. No item of money or money's worth can enter or leave the cash handling machine without leaving a readable record showing not only the amounts of money or money's worth received and paid but also the operator's name, the time and date of the transaction and the denomination of bills and coins received and paid out, which record can be related to the physical position of the stored bills.

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Croydon Printing Company Ltd.

Cash Handling System

The present invention concerns a cash handling system. Such systems are shown in British Patent Specifications 2088609A, 2088610A and 2088611A.

The present application is an improvement on the referenced patents and all other known prior art including United States Patents 4,251,867 and 3,222,057. The present invention is an improvement because it both recycles money and maintains a record or records of every transaction which takes place at a point of sale terminal or a cash handling machine. The record or records maintained are free from non-destructive interference in all embodiments of the present invention and free from some versions of destructive interference. In other words, if an operator or other person is not willing to destroy the record thus maintained it will show without doubt the exact course of a transaction. Further the present invention is operative to prevent many forms of destructive interference by the maintenance of a dual record. Still further, even a destructive interference will have to be quite clever to rebut the inference that the operator should be held responsible for the failure to see that a proper record is maintained.

The prior art has many examples of cash handling machines which divide primarily into two categories: the first is those machines intended to reduce or eliminate cash handling by employees in retail establishments. The second is the automatic teller machines which have become so prominent recently in the banking world.

The cash handling machines universally fail to have a sufficiently complete transaction record. The automatic teller machines neither recycle cash nor carry a transaction record adaptable to the retail sales transaction. In the automatic teller machines all records are related to an account number. The automatic teller machines all retain cash received in a way which either requires later employee verification or makes such verification impossible.

Accordingly, the invention provides a cash handling device comprising a secure housing for cash storage means; cash handling means accessible from outside the device capable of receiving and dispensing cash; transfer means which passes cash between the cash handling means and the cash storage means; sensor means which sense the number and denomination of cash received and dispensed; computer means actuable by a keyboard and controlling operation of the device, with a memory which receives data from the sensor means; and recording means receiving data from the computer means which maintains a record of the number and denomination of cash received and dispensed together with the date and time of the transaction.

In its most elemental form the present invention employs a cash handling device which can receive or dispense cash only through the actuation of a control element. The cash received is intended to be recyclable. Cash means money or money's worth in any form such as credit slips, stamps, coupons and the like. The cash handling device must be one in which money is sealed in a secure container which is accessible only through the actuation of a control element. The cash handling machine must store the mon y

received in an ordered manner so that cash received and dispensed can be related to a particular transaction from its position either in the device or when removed from the device.

The control elements which are actuated must cause a record of their actuation to be made and the actuation record thus made must be sufficiently precise to identify every transaction fully as to time, type and content including the number and denomination of every note or bill and coin, received or dispensed. With these elements no operator can remove or add cash to the automatic money handler without this being discovered by a later investigation.

Another embodiment of the present invention employs an operator identification system in which the operator wears a transponder which interacts with a device radiating energy, resulting in an automatic operator identification.

Without the transponder system, operator identification can be achieved by using any kind of operator "key". A "key" can be mechanical, electrical, electro-mechanical, keyboard entered code magnetic or any combination of them.

When an operator identification system is used the recording device records the operator identification entered for each transaction. As a practical matter, many retail operations only have one operator for either each shift or for each terminal.

The devices can be made in two basic embodiments: one in which the operator enters cash received from the

customer and one in which the customer directly enters the cash. For United States currency, the experts believe that a normally skilled person is the best counterfeit detector available. Therefore when the operator handles cash there should be no practical need to have a device to detect invalid currency. When the operator does not handle cash and when the customer may have reason to be suspicious of either the machine or the operator, it is desirable to have a viewing window to exhibit to the customer the cash entered into the device by the operator. It is useful to have a viewing window for the purpose of showing a customer that the bill received can be directly viewed. For example, the viewing window enables an operator to have a complete and accurate answer to the customer who claims that a ten dollar bill was given to the operator who only gave credit for a five dollar bill. The operator to complete the proof may have to actuate the "Cancel Current Sale" key which causes the device to return to its state before the commencement of its sale, thereby dispensing the bill paid in so far.

One embodiment of the present invention uses a computer, normally a micro-computer, to control the actuation of the various elements of the machine and to perform all accounting and audit functions which are desired or necessary. The programming of a micro-computer to properly direct and control the automatic money handler is a task within the present skill of those skilled in the art and therefore details of the programs controlling the device are not discussed in this application.

It is very important that the audit trail recorded is not available to the operator for either destruction or

alteration. One solution to this problem is the generation of a second audit trail not accessible to the operator, such as the creation of magnetic recording of the audit trail which can be converted to a humanly readable form if necessary.

In order that the invention shall be clearly understood, various exemplary embodiments will now be described with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of one embodiment of a cash handling machine;

Figure 2 is a block diagram showing the operator's actions in receiving and dispensing cash from the machine in Figure 1;

Figure 3 is a perspective view of a second embodiment of the present invention showing an automatic money handling machine for cash insertion by a customer;

Figure 4 shows a block diagram showing the operator's actions in accepting or rejecting money in actuating the embodiment shown in Figure 3;

Figure 5 shows a portion of an audit tape generated by the device shown in Figures 1 and 3 which forms a part of the present invention;

Figure 6 is a block diagram showing the interconnection of the various functional elements which form a part of the device shown in Figures 1 and 3;

Figures 7 and 8 show embodiments of keyboards which are used with the embodiments of the invention shown in Figures 1 and 3;

Figure 9 shows a side view of a coupon storage web; and

Figure 10 shows a side view of bill cache dump receiving box.

Figure 1 shows a perspective view of one embodiment of the present invention having a steel cabinet 16 which can be actually formed as a vault to have either or both burglary and fire protection capability. The cabinet 16 has a door 12 which can be locked either by a combination or a key. As shown in Application Serial Number 522,724, the entire assembly can be able to be locked within the vault into which it descends.

The cover 34 has a keyboard section 28, a bill receiving section 30 with bill input guides 40 and a bill viewing section 32 with windows 44. The cover 34 has mated with it a coin receiving bucket 46 which fits into cover well 36 and a coin delivery bucket 42. A coupon receiving slots 48 is shown adjacent the keypad portion of the keyboard.

The embodiment of the invention shown in Figure 1 may be used in conjunction with a cash register or point-of-sale device or it may itself perform that function. This specification is written on the basis that the point of sale function is performed by a separate device.

Figure 2 shows the sequence of operation of the device shown in Figure 1. The figure 1 embodiment of the

device is intended for use in an environment in which the operator receives money in some form from the customer.

A sale sequence would be as follows: The customer orders and the sale is "rung-up" on the cash register which electronically transfers the total of sale to the automatic money handler as shown in block 1. The operator receives payment in bills, coins, coupons or any combination of them. The operator's identification code is entered into the machine by some means which will be described in more detail later. The operator then deposits coins into the coin receiving bucket as described in more detail in copending United States patent application Serial Number 522,575. As described in that application, the coins are processed automatically. Bills received by the operator are placed one-at-a-time into the proper bill slot 40 which may be designated for $1's, $5's, $10's and $20's/others. In the case of $1's, $5's and $10's it is merely necessary for the operator to actuate the accept key to feed each bill. In an alternative arrangement, the money handler can be directed to accept all $1's, $5's and $10's fed to the bill input slot. In such a case, the operator needs only to actuate the proper keys if a bill $20 or larger is inserted into the machine or if some other form of non-cash payment such as cheque, credit card, stamp coupon, etc is used. The keyboard shown in Figure 7 would have the appropriate key actuated to indicate the type of payment received and the appropriate key or keys to indicate amount of such payment. This embodiment of the invention permits the rejection of any bill entered.

The automatic money handler calculates the total amount

of money received and determines the amount of change due if any. If change is due, the money handler delivers the appropriate change to the operator who in turn delivers it to the customer as shown in block 7 of Figure 2.

A second embodiment of the invention is shown in perspective in Figure 3. This automatic money handler 10 is intended to received money directly from the customer who places coins one-at-a-time in slot 26 and bills in the bill receiving trays 16 to input slots 18. The bills thus inserted into the machine are viewed through windows 20. The operator side 14 of the device 10 has a keyboard as shown in Figure 8. The detailed operation of this device has been described in United States patents 4,310,885 and 4,249,552 which are incorporated by reference herein.

The keyboard shown in Figure 8 of this application is a simplified version of that shown in the two referenced patents. In particular, the keyboard shown in this application has all of the keys in the referenced patents except those relating to the "Prompting Device". The operation of the device is similar to that previously described as shown in Figure 4 of the drawings. One important difference is that the device will not operate without the entry of an appropriate operator identification number. This is shown by the block marked 3 in Figure 2.

Entry of the operator identification can be achieved by any number of ways well known in the art. These include mechanical key, electro-mechanical key, magnetic key, entry of a proper code into the machine by magnetic stripe, k ypad code entry or radio signal entry of

code. In that connection, the patents listed below show such units which can be combined with the present invention: 4,047,156; 3,299,424; 3,752,960; 4,223,830; 4,236,068. It is well within the knowledge present in the art today to both require that an operator be identified and to record the identification thus required. What is considered inventive is to require such identification in combination with the maintenance of an accurate and thorough transaction record.

Figure 6 shows in block diagram form the various interconnections of the data processing elements which operate the electro-mechanical elements of the present invention. This basic operation has been thoroughly described in earlier United States patents and patent applications previously mentioned. The present configuration is different in several respects. The present device can accept various forms of non-cash payments as cash and these are stored in the coupon cache 902. Cache 902 is controlled by the data processor 350 through the multiplexer 368 in the same basic manner that the other bill receiving channels are controlled. In the embodiment of the present invention which has been shown the cache 902 is a serpentine web which holds relatively few coupons. Coupons stored in greater number than the capacity of the serpentine web are permitted to drop into a removal storage container. A structure to achieve this simple function is shown in Figure 9. United States patent 3,447,655 shows one embodiment of a device of this general type which generally satisfy the function sought to be performed. The device shown in this patent is not reversible but the d picted structure in the present invention is reversible and is easily programmed to control the reverser motion of the drive.

An important aspect of the present invention is the ability of the money handler to quickly take bills from cache storage to storage in another container. Further in the transfer from one container to another the order of the bills is not changed.

Another difference is shown by the addition of block 910 which is labelled "cache dump". The structure which may be used for this function is shown in Figure 10. It is shown as a separate mechanical element on the block diagram, Figure 6. In some embodiments it could be as simple as a box to be filled requiring no control elements. The device shown in Figure 10 is sufficient to permit the bills stored in the webs to be dumped at high speed and maintained in the order in which they were originally inserted into the machine.

The audit tape 701 shown in detail in Figure 5. The tape shows the date 706, time 702,720 amount due 708 the amount paid 710 and the change 712. The column 714 marked "deposit" shows what bills are deposited by denomination. Column 716 shows what bills are withdrawn from the machine also by denomination. This requirement implies that no bill cache which is able to receive more than one denomination of bill can dispense bills. Column 718 shows the designation "OID" which stands for "operator identification". The device will take the 14 to 16 bit binary operator code number typically used and convert it to a three digit number for printing on the tape.

Looking at tape 701 shows how the system works. The due, paid and change columns operation is obvious. In the deposit column 714 various entries are shown such as "I", "31", "V", "X", "T" which stand respectively

for: one dollar, three-one dollars, five dollars, ten dollars and twenty dollars.

Column 716 shows the bills dispensed as change using a code based on position of the column multiplied by a numeral which numeral is printed in the proper column. For example: "x" means no bill of that denomination; 1 means one such bill and so on, the three digit column is read from left to right as ten dollar bills, five dollar bills and one dollar bills. Looking down column 716, transaction segment 754 means that one ten, one five and two ones were dispensed as change. Transaction segment 756 shows that three ones were dispensed as change.

Because in most circumstances, coin change is relatively unimportant only the actual amount of change is indicated. However, the denomination of change dispensed can easily be shown since the information is available to the computer and can easily be printed out.

Paper tapes of the type shown can easily be destroyed or cut and pasted by dishonest employees. To prevent some such tampering, the tape will show the time for every transaction and will repeatedly show the day and date 704,706 at a frequency of every ten transactions. A still further precaution is to create a second source of audit control. There are many ways to create such a trail. One such way is shown in Figure 6, the printer-recorder 375 shown in that drawing is a device which can keep a three day record on magnetic tape of all transactions. One such tape recorder available is manufactured by Exatron of Sunnyvale, California and is called a "Stringy Floppy".

The present invention has been described with respect to specific structures. Those skilled in the art readily appreciate that there are very many ways to implement the present invention. Those various implementations which are within the scope and spirit of the present specification are intended to be within the scope of the appended claims. Forexample, the device in its present embodiment as programmed has a structured routine for "Cancel Previous Sale" which requires the entry into the machine of all bills, coupons and coins which were given as change before the device will return the bills, coins and coupons originally received. This exact transaction is of course recorded in detail on the audit tape.

Claims

1. A cash handling device comprising a secure housing for cash storage means; cash handling means accessible from outside the device capable of receiving and dispensing cash; transfer means which passes cash between the cash handling means and the cash storage means; sensor means which sense the number and denomination of cash received and dispensed; computer means actuable by a keyboard and controlling operation of the device, with a memory which receives data from the sensor means; and recording means receiving data from the computer means which maintains a record of the number and denomination of cash received and dispensed together with the date and time of the transaction.

2. A cash handling device as claimed in claim 1 wherein the bills or notes received are kept in the cash storage means in the order received so that they can be verified against said record.

3. A cash handling device as claimed in claim 1 or 2, wherein other than by force, no cash can be added to or removed from the cash storage means except under control of the keyboard and the computer, which transaction is added to said record.

4. A cash handling device as claimed in claim 1,2 or 3, which is only actuable by operation of a key or code specific to an individual operator, the record storing identifying data of the operator for each transaction.

5. A device as claimed in claim 4 including a radio frequency signal generator c ntained in said housing means and at least one device carried by an operator which interacts with the radio frequency signal generator means to generate a signal which can be fed to said computer means for entry in said record.

6. A device as claimed in any preceding claim, including a second recording means adapted to create a record duplicating the record created by the first recording means, wherein said second recording means is contained within said housing means inaccessible to all but those properly authorized.

7. A device as claimed in any preceding claim wherein said cash handling means has a viewing window to view cash inserted before it is passed to the cash bill storage means.

8. A device as claimed in any preceding claim, including a cache for the storage of cash dumped from the cash handling means.

9. A device as claimed in any preceding claim which is adapted to receive legal tender notes or bills, and other coupons.

10. A device as claimed in any preceding claim wherein any transaction initiated can be cancelled and the cash actually inserted can be returned before the transaction is completed.

11. A device as claimed in claim 9, including coupon storage means having a serpentine web formed of two continuous loops of flat flexible material.

12. A device as claimed in any preceding claim wherein said keyboard has keys to accept notes or bills, to reject them, and to show the notes or bills maintained in storage in the cash storage means.

13. A device as claimed in claim 6, wherein at least one of the recording means keeps an electronic record in machine readable form.

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FIG. 1

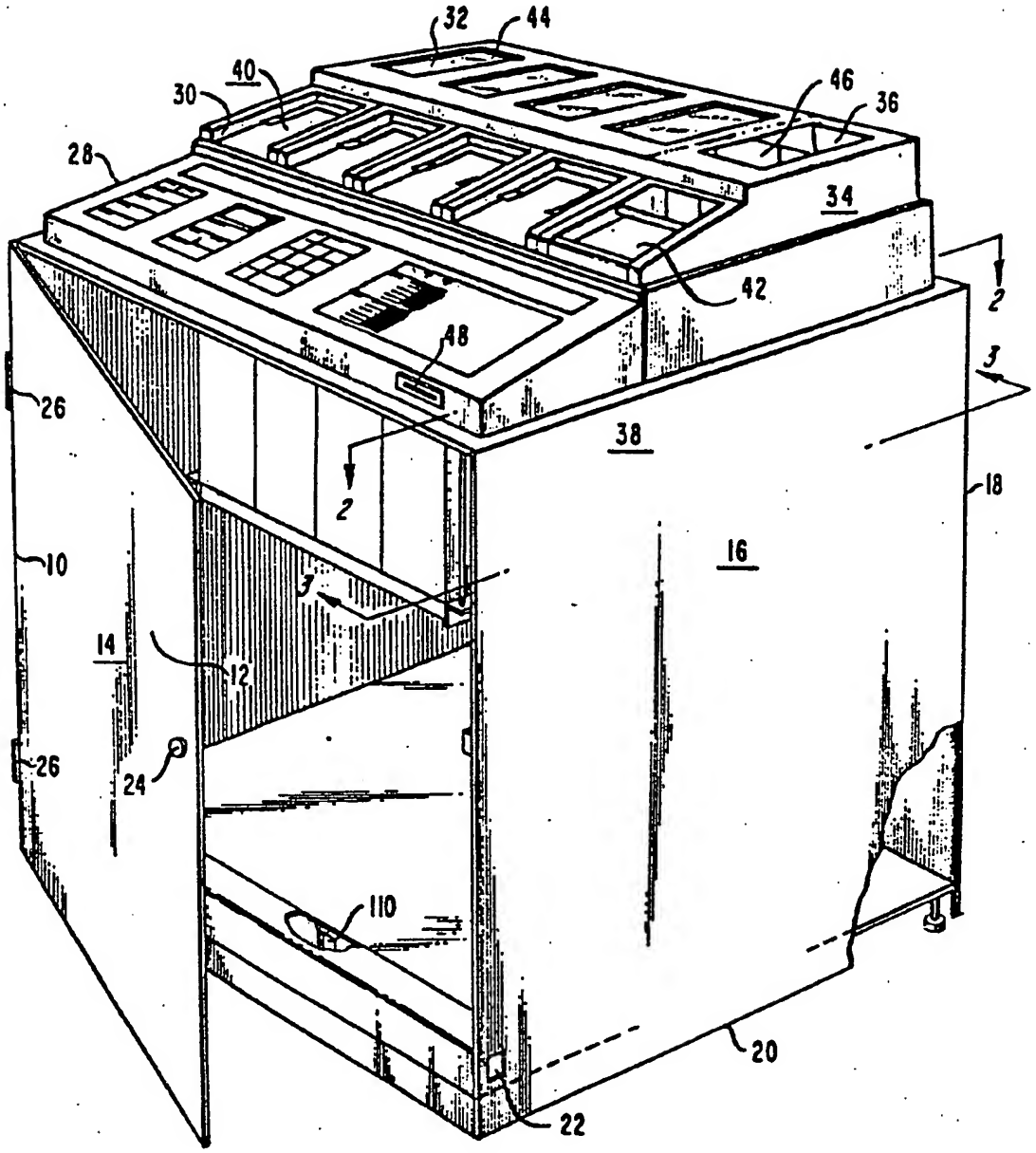

FIG. 2

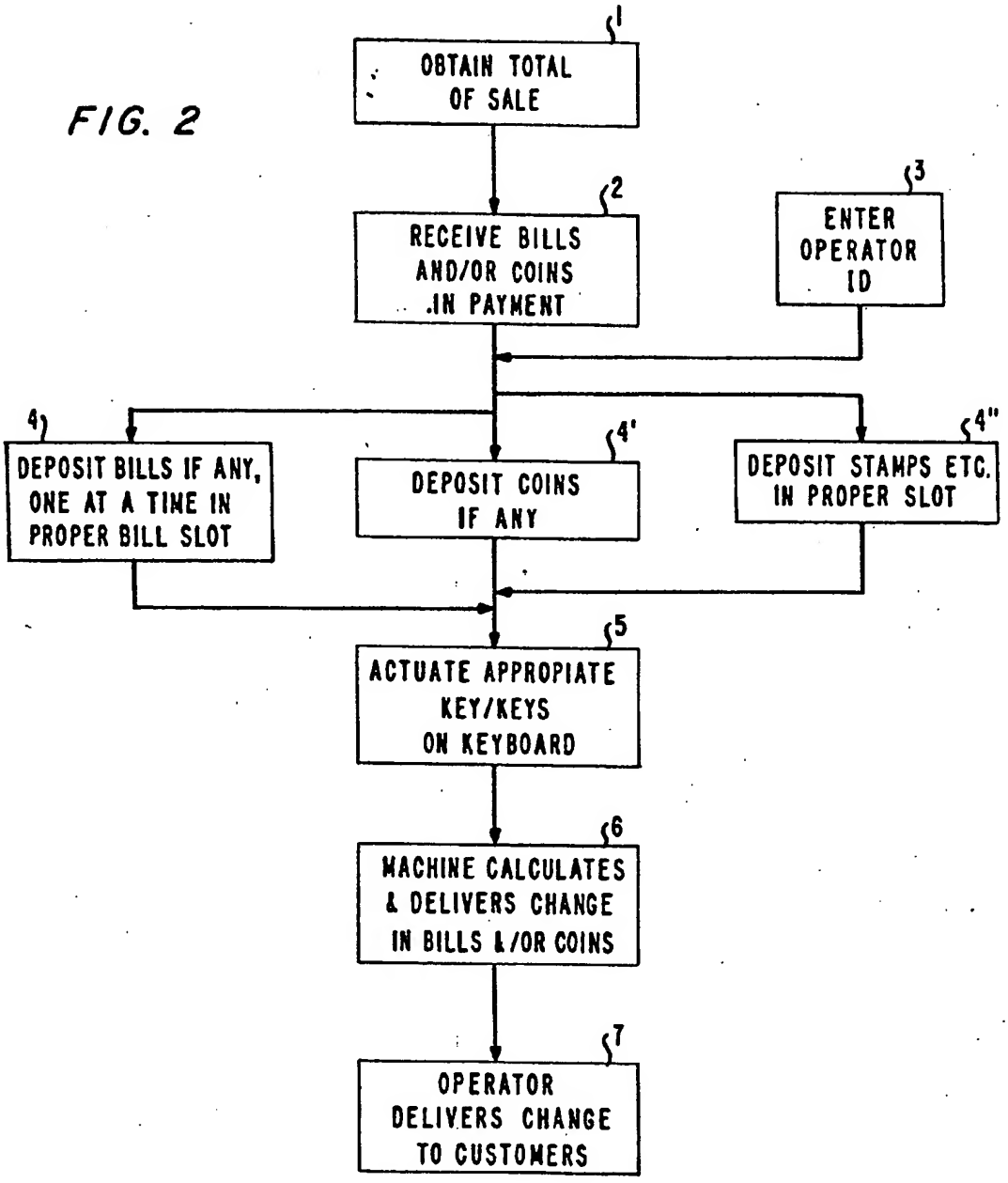
1
OBTAIN TOTAL OF SALE
2
RECEIVE BILLS AND/OR COINS IN PAYMENT
3
ENTER OPERATOR ID
4
DEPOSIT BILLS IF ANY, ONE AT A TIME IN PROPER BILL SLOT
4'
DEPOSIT COINS IF ANY
4"
DEPOSIT STAMPS ETC. IN PROPER SLOT
5
ACTUATE APPROPIATE KEY/KEYS ON KEYBOARD
6
MACHINE CALCULATES & DELIVERS CHANGE IN BILLS &/OR COINS
7
OPERATOR DELIVERS CHANGE TO CUSTOMERS

FIG. 3

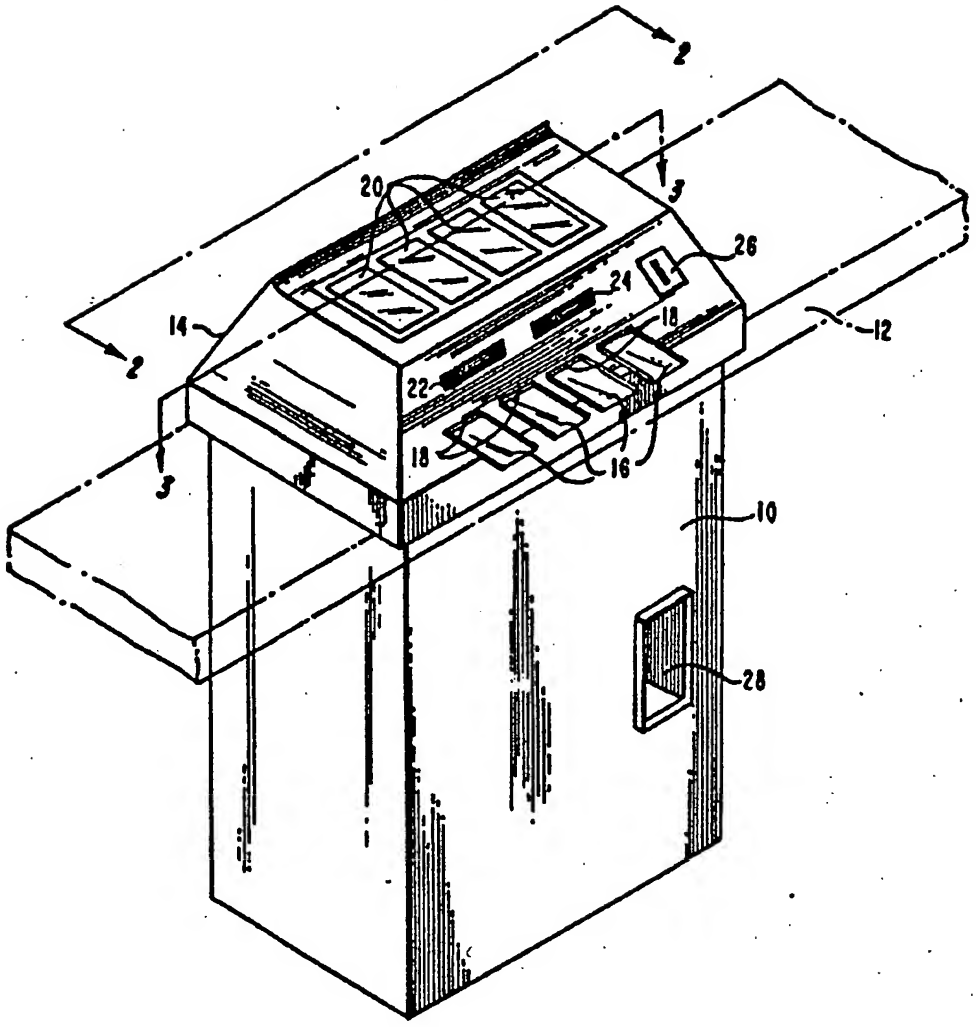

FIG. 4

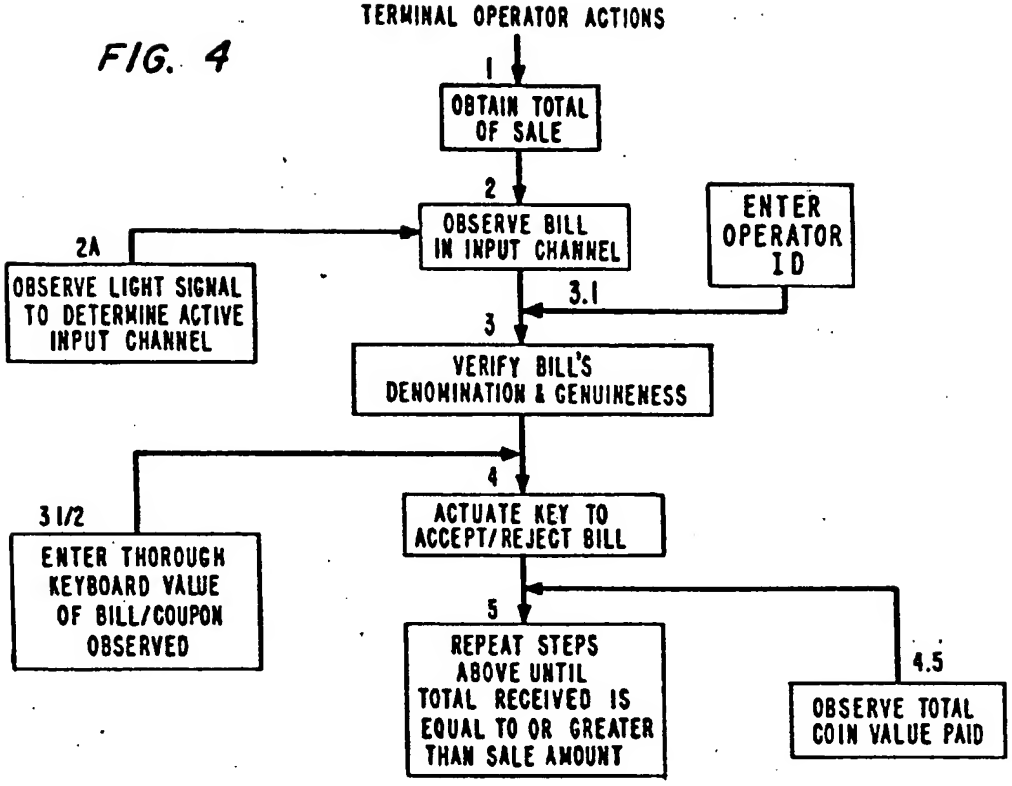
TERMINAL OPERATOR ACTIONS
1
OBTAIN TOTAL OF SALE
2
OBSERVE BILL IN INPUT CHANNEL
2A
OBSERVE LIGHT SIGNAL TO DETERMINE ACTIVE INPUT CHANNEL
ENTER OPERATOR ID
3.1
3
VERIFY BILL'S DENOMINATION & GENUINENESS
4
ACTUATE KEY TO ACCEPT/REJECT BILL
3 1/2
ENTER THOROUGH KEYBOARD VALUE OF BILL/COUPON OBSERVED
5
REPEAT STEPS ABOVE UNTIL TOTAL RECEIVED IS EQUAL TO OR GREATER THAN SALE AMOUNT
4.5
OBSERVE TOTAL COIN VALUE PAID

FIG. 5

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701

702 704 706
13:38 WED AUG 24 1983

STORE NO. 711 UNIT NO. 709

708 DUE	710 PAID	712 CHG	714 DEPOSIT	716 XVI	718 OID	720 TIME
722 .99	724 1.00	726 .01	728 I	730 XXX	731 123	732 13:39
PREVIOUS SALE CANCELED						
736 3.00	738 3.00	748 .00	750 3I	752 XXX	456	13:43
CURRENT SALE CANCELED						
9.00	9.00	.00	V4I	XXX	456	13:44
30.00	30.00	.00	TX	XXX	123	13:45
3.00	20.00	17.00	T	754 112		13:45
20.00	23.00	3.00	X2V3I	756 XX3		13:48
8.00		.00		XXX		13:48
CURRENT SALE CANCELED						

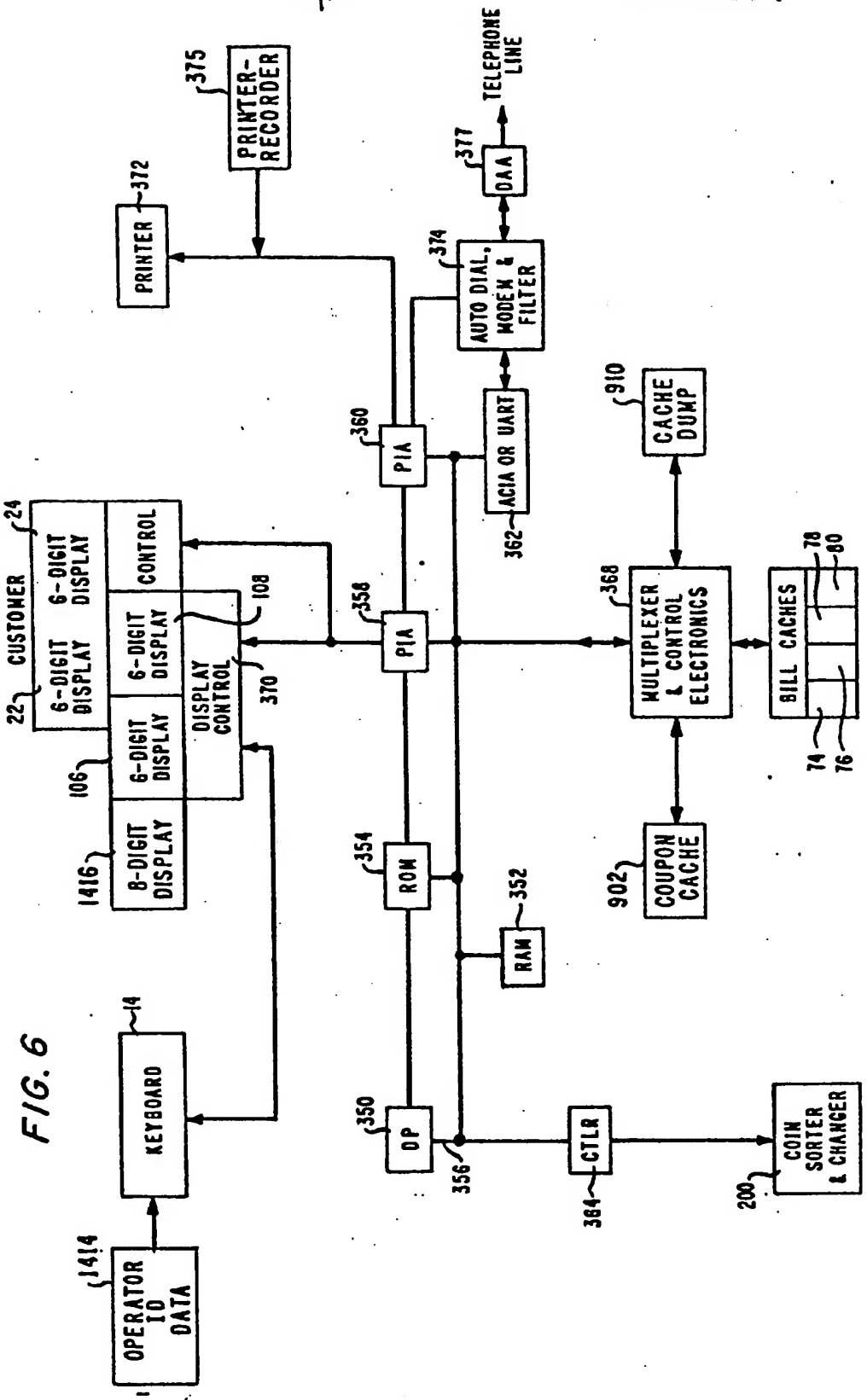
PRINTER-RECORDER
375
TELEPHONE LINE
377
DAA
PRINTER
372
AUTO DIAL, MODEM & FILTER
374
CACHE DUMP
910
PIA
360
ACIA OR UART
362
CUSTOMER
24
6-DIGIT DISPLAY
6-DIGIT DISPLAY
CONTROL
22
6-DIGIT DISPLAY
6-DIGIT DISPLAY
108
PIA
358
MULTIPLEXER & CONTROL ELECTRONICS
368
BILL CACHES
78
80
74
76
106
6-DIGIT DISPLAY
DISPLAY CONTROL
370
1416
8-DIGIT DISPLAY
ROM
354
RAM
352
COUPON CACHE
902
KEYBOARD
14
DP
350
CTLR
384
356
COIN SORTER & CHANGER
200
1414
OPERATOR ID DATA

FIG. 6

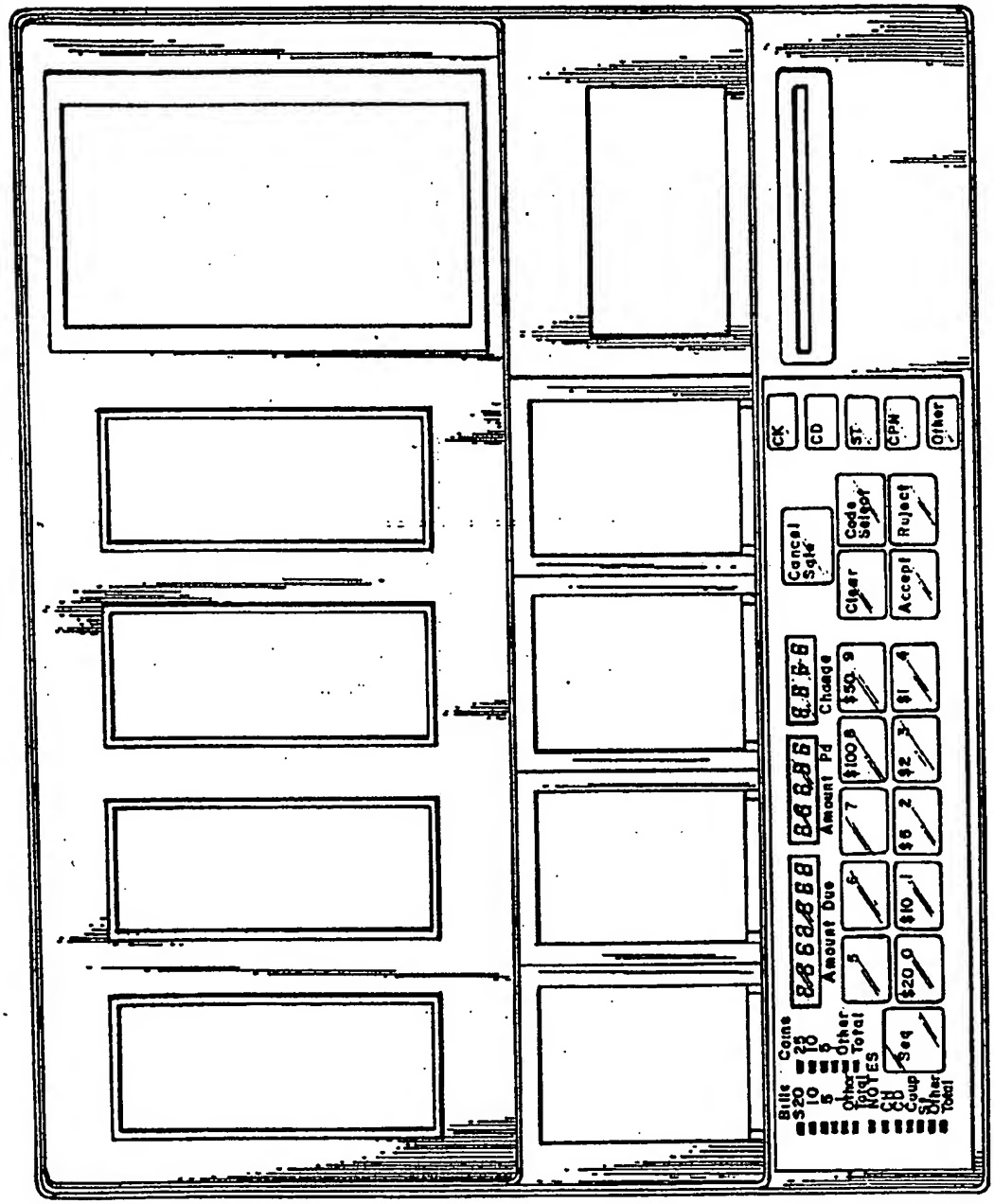
CK
CD
ST
CPN
Other
Cancel Sale
Code Selsor
Reject
Clear
Accept
Charge
Amount Pd
Amount Due
Bills
Coins
Other
Total
YES
NO
Other
Total

FIG. 7

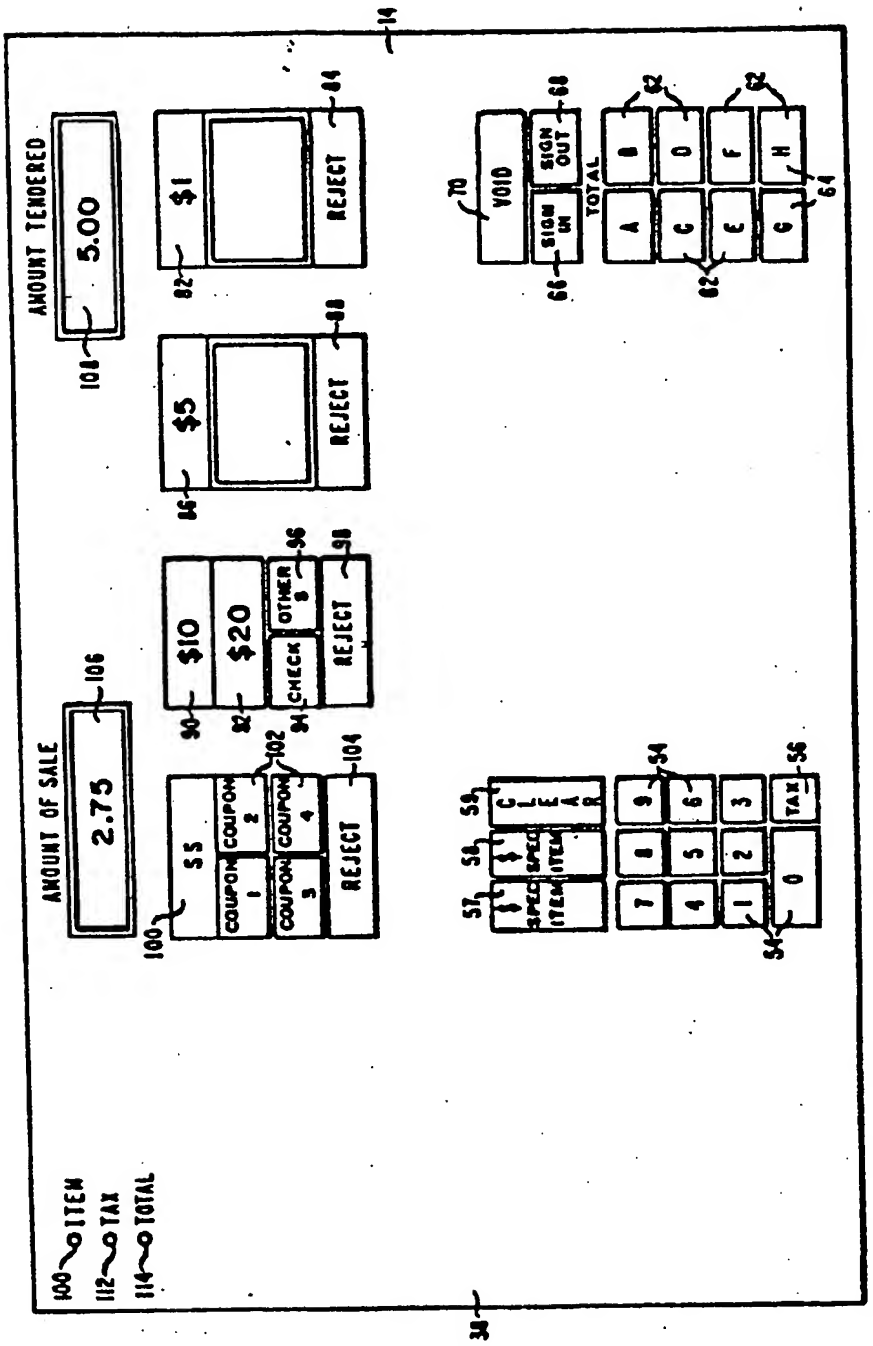
AMOUNT TENDERED
5.00
AMOUNT OF SALE
2.75
$1
REJECT
$5
REJECT
$10
$20
OTHER
CHECK
REJECT
$5
COUPON 1
COUPON 2
COUPON 3
COUPON 4
REJECT
VOID
SIGN OUT
SIGN IN
TOTAL
A
B
C
D
E
F
G
H
CLEAR
SPEC ITEM
SPEC ITEM
TAX
0
1
2
3
4
5
6
7
8
9
100 ITEM
112 TAX
114 TOTAL

FIG. 8

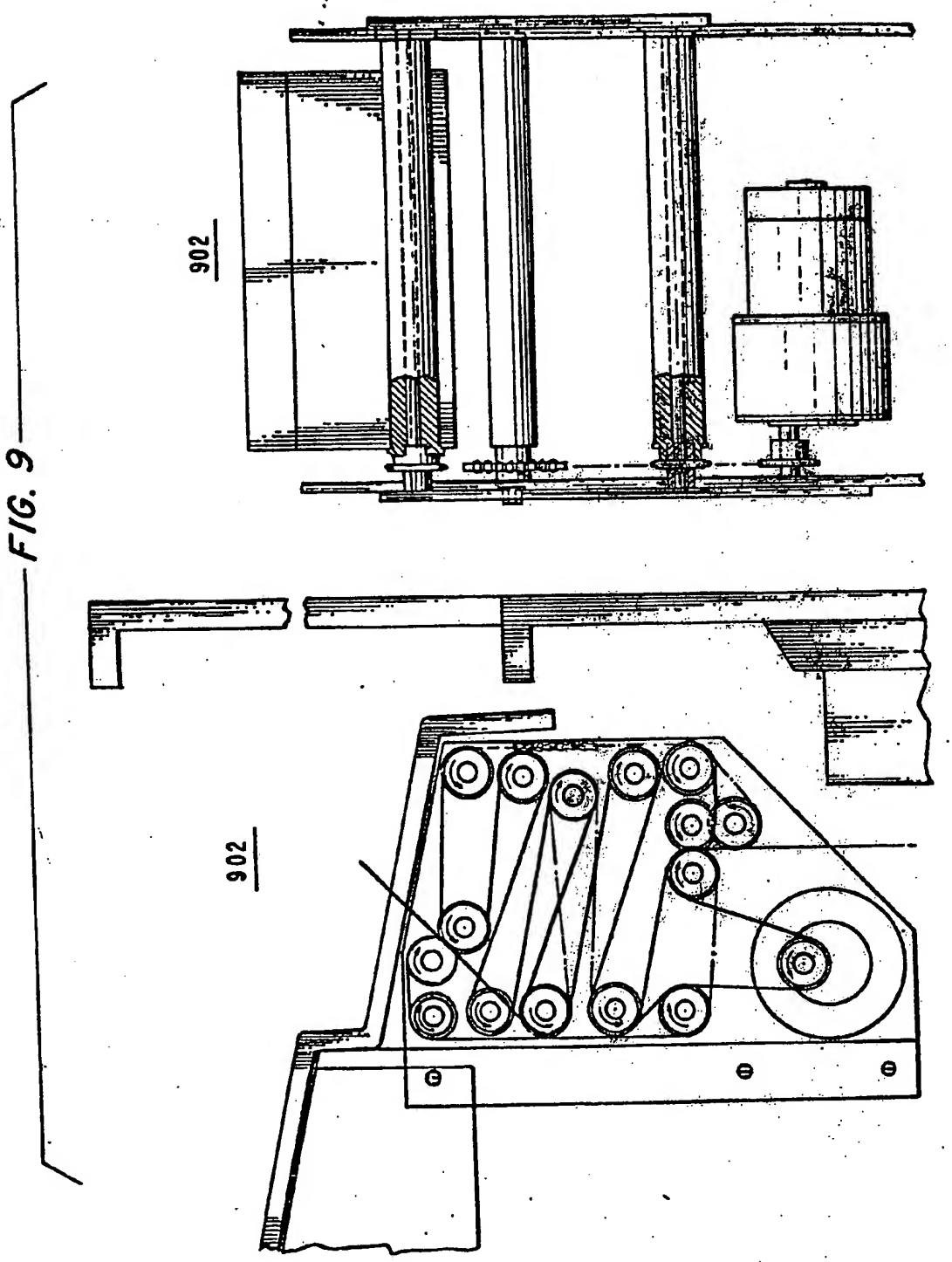

FIG. 9

FIG. 10